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Areawide Stored Grain IPM

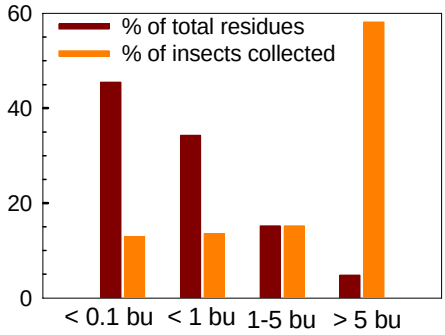
Monitoring Sanitation

As part of the sampling program for the IPM project, specific sites inside and outside the elevator were inspected for the presence of spilled or residual grain. These sites included the boot, dump pit, headhouse, rail line, and elevator tunnel. This sanitation inspection was done weekly, and both the amounts of spilled grain and the time it took to do the inspection was recorded at each elevator. Samples of the spilled grain were sent to the central laboratory, where they were examined for insects.

One of the barriers to starting and maintaining a regular sanitation program is the perception that it requires too much time to do the inspections. Results from our study show that it took very little time to inspect the areas in the elevator and take samples of the residues. The average time required for the sanitation inspection ranged from 6 to 32 minutes, depending primarily on the size and characteristics of individual elevators.

Amount of Grain Residue

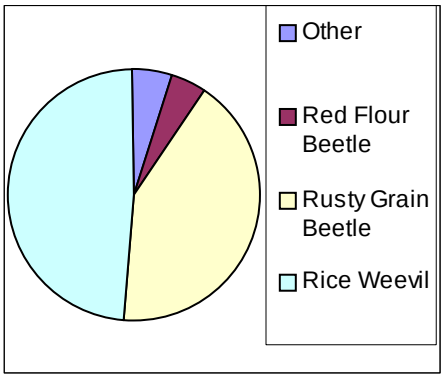
Generally the sites that were inspected contained very little residual grain, and about 81% of the time it was less than a bushel. Residues of more than 5 bushels were rarely found, however, the majority of the insects collected were from grain taken from these samples.



Percentage of total samples of each volume and the percentage of total insects found in those volume samples

Insects Found

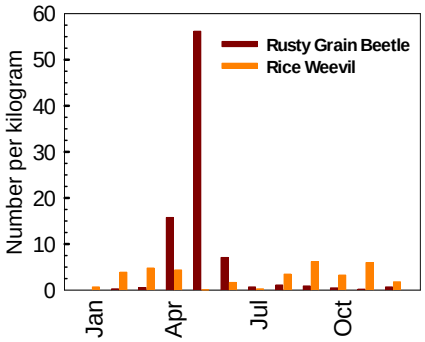
The percentage of samples where insects were found at each site ranged from 19 to 61%. The rusty grain beetle and the rice weevil together comprised 90% of the total number of insects found in the residue samples from all the elevators. Large numbers of rusty grain beetles have been collected from grain samples taken from elevator bins, but the numbers of rice weevils from those samples were relatively low compared to other species. The rice weevil is an internal feeder, and infestations of this species can cause serious economic damage. The percentage of rice weevils in the sanitation samples document the presence of this species within the elevator environment.



Composition of insect species from sanitation samples taken at grain elevators.

Seasonal Insect Trends

Population trends for the rusty grain beetle and the rice weevil appeared to differ throughout the year. More rusty grain beetles were collected from sanitation samples taken in April, May, and June than in all the other months combined, while the number of rice weevils col-



Number of rusty grain beetles and rice weevils found each month in sanitation samples.

lected from the sanitation samples were generally lower during the hot summer months. The numbers of rusty grain beetles in these sanitation samples could be related to overall population increases of this species during a typical storage season.

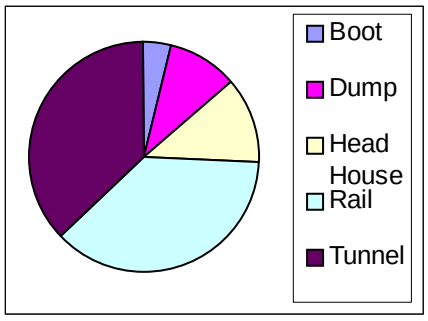
Beneficial Insects

The numbers of beneficial insects (parasitic wasps) was relatively high in the residue samples. One species of wasp, *Anisopteromalus calandrae*, was very abundant. This species specifically attacks the lesser grain borer and the rice weevil. It was probably attacking the rice weevil, because the rice weevil was much more abundant than the lesser grain borer in the grain residues. An unexpected benefit of grain residues may be that beneficial insects emerging from the residues may spread to nearby grain bins, and thus, help protect the binned grain.

A "good" insect, *Anisopteromalus calandrae*, attacks the lesser grain borer and rice weevil.

Grain Residues Found

Most of the insects were found in samples taken from the boot and tunnel inside the elevator. Spilled grain can easily accumulate in these areas, and they can be difficult to clean. Grain residues that are left in a boot pit for long periods of time are probably more likely to develop infestations. These infestations could then infest clean grain that passes through these areas.



Percentages of sanitation samples taken from specific locations inside and outside elevators.

The table below shows that the highest numbers of insects were found in empty bin residues. We are currently conducting a study to see if cleaning the bins prior to harvest, reduces insect infestation in these bins.

In general, the level of sanitation has been good for the elevators involved in the Areawide IPM Project. At 16 elevators over a two-year period, less than 1000 bushels of grain have been reported as residues, and most of these residues were cleaned up within two weeks.

Type of Sample	Avg. Number per kg	Number of Samples
Belts, Spouts, etc	1.8	3,078
Residues in Elevator	8.7	368
Residues in Empty Bins	15.8	51

Insect densities in samples from moving grain, residues in elevators, and empty bins prior to harvest.

Conclusion

IPM Newsletter is printed quarterly for our industry cooperators. This is a joint research project between the GMPRC (USDA, ARS), Kansas State University and Oklahoma State University.

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